

NOTES ON THE HABITAT, FLYING SPEED AND
BEHAVIOUR OF *AUSTROPHLEBIA COSTALIS* (TILLYARD)
(ODONATA: AESHNIDAE) IN BRISBANE FOREST PARK,
QUEENSLAND

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Abstract

During surveys in Brisbane Forest Park (1991-1994), *Austrophlebia costalis* was recorded from November to February. Most observations were from flowing streams in open or closed forest but two were next to a dry, rocky creek-bed in eucalypt open forest. Three dawn-to-dusk surveys in December, January and February indicated that *A. costalis* was active from 0600 to 1800 h EST with no marked crepuscular peaks in activity but low activity from 0900-1200 h EST. The mean speed of the hawking flight was 6.2 km/hr and that of fast flight was 17.7 km/hr. The fastest timed speed was 34.1 km/hr.

Introduction

Austrophlebia costalis (Tillyard) is one of the largest Australian dragonflies (abdomen 70 mm, hind-wing length 60-68 mm [Fraser 1960]) and its size, chocolate brown body and the dark brown bands running along the costal length of each wing make it quite distinctive. It has a wide distribution along the east coast of Australia (Watson *et al.* 1991) but little is known of its biology apart from the early observations of Tillyard (1916). However, it has received some international consideration (Hocking 1953, Corbet 1962) following the statements by Tillyard (1916, 1917) concerning its flight speed. This paper provides additional observations on its habitat preference, daily activity patterns and flight speed.

Study Area and Methods

Incidental observations were made during 12 km walked transects for avian surveys in Brisbane Forest Park, west of Brisbane, conducted twice a month from May 1991 to March 1994. The transects cover most of the major vegetation types of Brisbane Forest Park (Young 1982) including closed notophyll forest, closed microphyll forest, open eucalypt forest and woodland and they cross some of the many small streams draining the park, including those flowing east into Love Creek/Cedar Creek and Enoggera Creek.

More detailed observations were collected during dawn-to-dusk observations at Love Creek (27°19'S 152°45'E, 600 m asl) where the shallow, rocky stream flows in open forest with a mid-stratum of bangalow palm *Archontophoenix cunninghamiana*. Records of flight speed were made here using a stopwatch (accurate to 0.01 s) to time flights between prominent landmarks over stretches of the stream (7-11 m) measured using a rangefinder (accurate to 0.2 m at this distance). This relatively short distance was used because I found it very difficult to detect fast flying *A. costalis* at ranges greater than about 20 m in the conditions of low light intensity and it was essential to have a lead-in to prepare for timing prior to the timed and measured distance.

Results and Discussion

Habitat Selection

Most observations of this species were made at flowing streams in closed (Greene's Falls) or open forest (Love Creek) surrounded by dense vegetation. Nymphal exuviae identified as belonging to *A. costalis* were found at Love Creek, indicating that it does breed here. However, on two occasions (17.xii.1991, 28.xi.1992) an adult was seen settled on shrubs adjacent to a dry rocky creek bed in eucalypt open forest, between Boombana and Jolly's Lookout, lacking palms or any other type of dense vegetation and having an understorey of grass. Water flows in this section of the creek only for a short period after heavy rainfall (pers. obs.) but further downstream it joins Enoggera Creek which has permanent water and is surrounded by a thin strip of closed forest.

Most previous descriptions of the habitat of this species from the Dorrigo Tableland, NSW and Mount Tambourine, Qld. (Tillyard 1916) related to flowing streams surrounded by dense vegetation (? closed forest) but, at Dorrigo, Tillyard (1916) reported flushing two newly emerged females from their perching sites "some hundred yards or more above the beginnings of a small gully". These observations indicate that *A. costalis* will occasionally move into more open, drier habitats away from the forest streams but the reasons for these movements require further investigation.

Daily Activity

Four dawn-to-dusk (0400 - 1900 h EST) surveys were made at Love Creek on 30.xii.1992, 27.i.1993, 12/13.ii.1993 and 26.xi.1993. A record of *A. costalis* activity was deemed to be a flight either up or down the creek past the observer. These were collected incidentally to a survey of avian calling activity but it is considered unlikely that any *A. costalis* were missed due to the other monitoring activity. Weather conditions during these days varied from overcast conditions with showers to bright sunny periods. Even during the sunny spells, 90-95% of the creek was in shade due to the canopy of palms. There was no obvious association between the weather and flight activity; *A. costalis* was recorded flying during both drizzle and sunny periods. No *A. costalis* were recorded during the November survey but results from the other three days are presented in Fig. 1. There are records of *A. costalis* activity from throughout the day, apart from the first two hours of light and low activity from 1000 to 1200 h and there is no indication of any marked crepuscular peak in activity.

The only observations on the activity patterns of *A. costalis* are given by Tillyard (1916) who stated "The earliest time of day at which I saw this insect in flight (apart from occasionally disturbing resting females in the morning) was about 1 o'clock on a dull stormy day. They seldom fly at all until 4 pm but from that hour to sunset are particularly active". Other statements, possibly repeating those of Tillyard (1916), are given by Fraser (1960) "... probably mainly crepuscular"; Houston and Watson (1988) "...

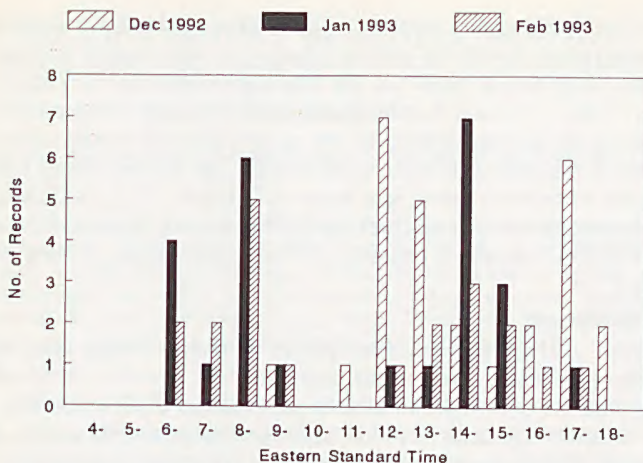


Fig. 1. Daily activity pattern for *Austrophlebia costalis* at Love Creek, Brisbane Forest Park.

tending to crepuscular activity"; Watson *et al.* (1991) "... probably mainly crepuscular". At Love Creek, *A. costalis* is active for a far greater period of the day than these statements imply.

Speed of Flight

During observations at Love Creek, two types of flight were observed. One was a slower hawking flight with a variable number of lateral deviations or 'jinks' while the other was a fast direct flight, with no lateral deviations. The mean speed of the hawking flight was 6.2 km/hr (s.e. 1.0, n = 9) and the mean speed of the fast flight was 17.7 km/hr (s.e. 2.5, n = 11). The fastest timed flight was of 34.1 km/hr but one untimed flight was considerably faster.

The first account of the flying speed of *A. costalis* was given by Tillyard (1916) "The distance from my watching-place, to the ledge of rock over which the swift-flying males first appeared was, as near as I could judge, about eighty yards. From the time they first appeared to the time they passed me was barely sufficient for me to grip my net and steady myself to strike. At the most it could only have been two or three seconds, which gives these insects the incredible speed of about sixty miles an hour". This description indicates that neither the distance nor the time were measured but it was repeated by Tillyard (1917) as, "I had the opportunity once of timing it over a measured stretch of between eighty and ninety yards. The distance was covered in three seconds; so that this Dragonfly can fly at the rate of nearly sixty miles per hour!" [c. 100 km/hr]. This value has been cited subsequently as exceptionally fast but its validity has been questioned by Corbet (1962) following calculations of Hocking (1953) which indicated a theoretical maximum air-speed of 57 km/hr and a maximum sustained flight of 38 km/hr

for *A. costalis*. However, Hocking (1953) acknowledged that factors such as a following wind, downhill flight or the short distance could account for the difference. It is also obvious that the original description by Tillyard (1916) suggests far less precision than his subsequent statement (Tillyard 1917) and a difference in the estimated time of one or two seconds would cause a major difference to the final calculations of speed. The fastest speeds timed from Love Creek were much lower than those of Tillyard (1916, 1917) and more in line with the calculations of Hocking (1953) but my (untimed) observation indicated that *A. costalis* is capable of even faster speeds, at least over short distances.

General Behaviour

As Tillyard (1916) recorded, the species generally hangs vertically from streamside vegetation, often on the underside of a tree-fern frond and in this position with its dark coloration it is particularly difficult to see. Flying activity of adults has been recorded from November to February in Brisbane Forest Park, slightly extending the period of November to January given by Fraser (1960) but Tillyard (1916) also records two specimens taken in February. Tillyard (1916) records females ovipositing into small submerged logs or twigs. This was preceded by a "quick to-and-fro" movement of the abdomen which he interpreted as a sawing of the wood with the projecting teeth of abdominal segment 10 to open the wood. I twice saw females probing with the end of their abdomen into a fallen branch or the roots/rhizomes exposed at the edge of the river bank. These were both out of water; in the case of the branch it was above a small pool and in the case of the roots it was within a few cm of the water's edge. I cannot be certain that actual oviposition took place in either instance.

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